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# IMPLEMENTATION OF DRONE-ASSISTED IRRIGATION SYSTEMS AS A TECHNOLOGICAL INNOVATION TO OPTIMIZE AGRICULTURE IN EASTERN ROMANIA

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**Abstract:** *The implementation of drone-assisted irrigation systems optimizes water use through real-time monitoring and localized irrigation; however, their adoption requires overcoming technical, economic, and specialized training challenges. Despite this, they improve agricultural productivity and sustainability. This article provides a comparative description of the DJI Agras T30, DJI Agras T40, and XAG P100 models for use on crops in eastern Romania.*

• **Introduction**

Romania experiences water stress of 6%, reflecting sustainable use but with limitations in resource management, especially due to high agricultural consumption, which accounts for 36.25% of available freshwater (World Bank, 2021). In the eastern region, where the Prut River basin predominates, increased agricultural activity has reduced groundwater levels (Minea et al., 2020). Given this situation, the use of drones equipped with multispectral and thermal sensors is proposed to optimize irrigation, conserve water, and improve agricultural productivity (Maghiari et al., 2025).

• **Material and method**

The methodology of this study is qualitative, and the analysis involved a review of literature published since 2020 in English, Spanish, and Romanian. In addition, this scientific article describes three models of agricultural drones: DJI Agras T30, DJI Agras T40, and XAG P100. Furthermore, it describes the economic costs and current regulations for the use of assisted drones for irrigation.

• **Results and discussions**

**Table 1.** Comparative table of drone-assisted irrigation systems.

| Feature/Type of drone   | DJI Agras T30                                                                                                                                                                                                                                                                                                                    | DJI Agras T40                                                                                                                                                                                                                                                                                                                                                                                | XAG P100                                                                                                                                                                                                                                                                             |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specifications          | <ul style="list-style-type: none"><li>- Spreading tank volume: 30 L</li><li>- Flight time: 20 to 25 minutes</li><li>- Maximum range: 7 km</li><li>- Wind resistance: 12 m/s</li><li>- Intelligent motor for 3D operation planning</li><li>- Intelligent altitude control</li><li>- High-precision radar and flow meter</li></ul> | <ul style="list-style-type: none"><li>- Spreading tank volume: 40 L</li><li>- Flight time: 6 to 18 minutes</li><li>- It contains sensors to avoid obstacles</li><li>- Good spray width</li><li>- Wind resistance: 6 m/s</li><li>- EFI generator with 15% fuel savings</li><li>- Integration with mapping and flight planning systems, allowing application in heterogeneous areas.</li></ul> | <ul style="list-style-type: none"><li>- Spreading tank volume: 40 L</li><li>- Flight time: 25 minutes</li><li>- Maximum range: 8 km</li><li>- Wind resistance: 10 m/s</li><li>- AI-controlled smart spraying</li><li>- Durable design</li><li>- Increased payload capacity</li></ul> |
| Disadvantages           | <ul style="list-style-type: none"><li>- Frequent speed control to avoid falls or collisions with plants</li><li>- Limited battery life</li><li>- Small fuel tanks compared to ground-based machinery.</li><li>- Requires constant recharging and refueling</li><li>- Less effective in very large areas.</li></ul>               | <ul style="list-style-type: none"><li>- Short battery life. With a full tank: 6 to 7 minutes. Empty tank: 18 minutes</li><li>- Sensitive to wind</li></ul>                                                                                                                                                                                                                                   | <ul style="list-style-type: none"><li>- High energy consumption</li><li>- Difficult-to-use interface</li></ul>                                                                                                                                                                       |
| Operational performance | 16 hectares/hour                                                                                                                                                                                                                                                                                                                 | 21 hectares/hour                                                                                                                                                                                                                                                                                                                                                                             | 20 hectares/hour                                                                                                                                                                                                                                                                     |
| Relative price          | \$15,000 to \$18,000                                                                                                                                                                                                                                                                                                             | \$25,000 to \$35,000                                                                                                                                                                                                                                                                                                                                                                         | \$15,000 to \$19,000                                                                                                                                                                                                                                                                 |
| References              | <a href="#">Preda et al. (2025)</a><br><a href="#">Maghiari et al. (2025)</a>                                                                                                                                                                                                                                                    | <a href="#">de Koff and Howard (2025)</a>                                                                                                                                                                                                                                                                                                                                                    | <a href="#">Maghiari et al. (2025)</a><br><a href="#">Mamchur and Studinska (2024)</a>                                                                                                                                                                                               |

Note: Created by the authors.

**Table 2.** Types of agricultural assisted-drones used for crop irrigation.

| DJI Agras T30                                                                         | DJI Agras T40                                                                         | XAG P100                                                                              |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |  |  |

According to data from the European Union (2022), more than 90% of farms in the eastern region are less than 5 hectares in size. In this context, the DJI Agras T30, with its 30-liter capacity and high maneuverability, is the most suitable option for small plots and permanent crops, such as vineyards, where localized application is essential. The DJI Agras T40 and XAG P100, although offering greater capacity (40L) and wider coverage, are more suitable for cooperatives or medium-sized farms (0.9%) equipped with water storage infrastructure and trained personnel.

On the other hand, the current regulatory framework in Romania, aligned with the guidelines of the European Aviation Safety Agency (EASA) allows the use of drones for agricultural purposes under the supervision of the Autoritatea Aeronautică Civilă Română (AACR) and with the necessary authorizations from the Ministry of Agriculture for spraying or irrigation operations. In this context, the use of agricultural drones such as the DJI Agras T30, T40, and XAG P100 models in eastern Romania is legally viable within the Specific category, provided that operators have the appropriate certification and insurance.

• **Conclusions**

This study has demonstrated that the implementation of drone-assisted irrigation systems is a viable and sustainable technological alternative for agriculture in eastern Romania, optimizing water use and productivity. Detailed analysis proved that the DJI Agras T30 model is the most suitable for the characteristics of the region, highlighting its precision and maneuverability in vineyards and small-scale farms with the proper authorization. Despite its clear contribution to sustainability, the adoption of this technology is limited by cost, training, and regulatory barriers. For this reason, it is recommended that integrated policies offering financial support and technical training from the government be implemented as a strategic and indispensable step toward agricultural modernization and the reduction of annual crop losses.